

November 2, 2012

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UL 567A

OUTLINE OF INVESTIGATION

FOR

EMERGENCY BREAKAWAY FITTINGS, SWIVEL CONNECTORS AND
PIPE-CONNECTION FITTINGS FOR GASOLINE/ETHANOL BLENDS WITH
NOMINAL ETHANOL CONCENTRATIONS UP TO 85 PERCENT (E0 – E85)

Issue Number: 1

November 2, 2012

Summary of Topics

This is the first issue of the Outline of Investigation for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85), UL 567A.

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INTRODUCTION

1 Scope

1.1 These requirements cover emergency breakaway fittings, swivel connectors and pipe-connecting fittings of the threadless compression type. Connectors and fittings covered by these requirements are intended only for the following services.

1.2 A swivel connector is either a hose swivel or joint swivel. The swivel connector will allow radial movement and shall be constructed for use with the fluids shown in 1.4.

1.3 An emergency breakaway fitting is used between the outlet of the dispensing device and the hose nozzle valve and separates in the event that the coupling is subjected to an excessive pull force to safeguard against abnormally excessive pull force on the hose assembly and dispenser and prevent loss of liquid. An emergency breakaway fitting shall be constructed for use with the fluids shown in 1.4. The fittings shall be of the single-break or reconnectable type.

1.4 Emergency breakaway fittings, swivel connectors, and pipe-connecting fittings are intended for use with one or more of the following as applicable:

- a) Gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814;
- b) Gasoline/ethanol blends with nominal ethanol concentrations up to 25 percent ethanol (E25), consisting of gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814, when blended with denatured fuel ethanol formulated to be consistent with the Standard Specification for Denatured Fuel Ethanol for Blending With Gasolines For Use as Automotive Spark-Ignition Engine Fuel, ASTM D4806; or
- c) Gasoline/ethanol blends with nominal ethanol concentrations above 25 percent formulated in accordance with the Standard Specification in item (b) or formulated in accordance with the Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines, ASTM D5798.

1.5 Requirements for the installation and use of dispensing equipment handling the fuels described in 1.4 are included in the Flammable and Combustible Liquids Code, ANSI/NFPA 30, and the Code for Motor Fuel Dispensing Facilities and Repair Garages, ANSI/NFPA 30A.

1.6 These requirements do not cover devices intended for use with diesel, biodiesel, diesel/biodiesel blends, kerosene or fuel oil, which are covered under the Outline of Investigation for Emergency Breakaway Fittings, Swivel Connectors, and Pipe-Connection Fittings for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends With Nominal Biodiesel Concentrations Up To 20 Percent (B20), Kerosene, and Fuel Oil, UL 567B.

1.7 These requirements do not cover devices intended for use with anhydrous ammonia or LP-Gas, which as covered under the Standard for Emergency Breakaway Fittings, Swivel Connectors, and Pipe-Connection Fittings for Petroleum Products and LP-Gas, UL 567.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this outline shall comply with the requirements for that component.

2.1.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this outline, or
- b) Is superseded by a requirement in this outline.

2.1.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.2 Units of measurement

2.2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.3 Undated references

2.3.1 Any undated reference to a code or standard appearing in the requirements of this outline shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 For the purpose of this outline the following definitions apply.

3.2 **BLENDING OPTION** – Dispensing devices may be provided with an option that blends two specific fuels into one fuel to be dispensed. This blending occurs at the dispenser level and can be in two forms:

- a) **Fixed blending** – Blending at the dispenser level that blends two specific fuels into one fuel to be dispensed, and that fuel to be dispensed is fixed. For example, fixed blending includes blend options where gasoline and denatured fuel ethanol can be blended to achieve E85, which is the actual dispensed fuel.
- b) **Variable blending** – Blending at the dispenser level that blends two specific fuels into the fuel to be dispensed, but the fuel to be dispensed can be any of a number of previously set points. For example, variable blending includes blend options where gasoline and E85 can be blended to achieve E40, E60, and E85 as the actual dispensed fuel.

3.3 **FITTING, PIPE-CONNECTING** – A fitting of the threadless compression seal-ring type for use in the assembly of dispensing devices to facilitate connection of piping or tubing. These fittings shall be made in the straight coupling style, as well as in the tee, ell, reducer, adapter, and other styles.

3.4 FITTING, RECONNECTABLE TYPE – An emergency breakaway fitting designed such that upon separation it is intended to be reconnected and reused when it is not damaged.

3.5 FITTING, SINGLE-BREAK TYPE – An emergency breakaway fitting that, upon separation, is not intended to be reconnected and reused.

3.6 GASOLINE/ETHANOL BLENDS – Blended fuels composed of a gasoline component and an ethanol component. The numerical value corresponding to the ethanol component determines the blend rating (such as E85 for 85% ethanol, 15% gasoline).

3.7 HOSE SWIVEL – A swivel connector with one end attached to a hose and the other end to an appurtenance. The hose swivel will allow radial movement of the hose and/or appurtenance to prevent the hose from twisting or having torsional stress.

3.8 PRESSURE INDICATING DEVICE – As used herein, the pressure indicating device means one of the following:

- a) An analog gauge having a pressure range such that the test pressure is between 30 and 70 percent of the maximum scale reading of the gauge;
- b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or
- c) Other device that is equivalent to the devices in (a) or (b).

3.9 SEALS, DYNAMIC – A seal that is subject to mechanical movement or other applied forces that result in movement or flexing of the seal under normal use conditions.

3.10 SEALS, STATIC – A seal that is not subject to mechanical movement or other applied forces other than compressing forces that are applied during installation, after which, the seal is held in place during normal use conditions.

3.11 SWIVEL CONNECTOR – A type of swivel categorized as either a hose swivel or swivel joint.

3.12 SWIVEL JOINT – A swivel connector installed in a piping system with at least one end attached to a rigid pipe or other appurtenance that is firmly affixed. The swivel joint will allow radial movement of the pipe or other appurtenance attached to the swivel to prevent torsional stress.

4 Installation and Operating Instructions

4.1 A copy of the installation and operating instructions shall be provided and shall be used as a guide in the examination and test of the device. For this purpose, a final printed edition is not required.

4.2 The instructions shall include directions and information as deemed by the manufacturer to be adequate for proper and safe installation, maintenance and use of the device.

4.3 Each emergency breakaway fitting shall be provided with instructions that indicate how to determine that the maximum rated separation force will not damage the hose assembly or dispensing device.

4.4 Each swivel connector shall be provided with instructions that indicate if it is a hose swivel or swivel joint.

CONSTRUCTION

5 General

5.1 A connector or fitting shall be constructed for an operating pressure of not less than 50 pounds per square inch gauge (psig) (340 kPa) for the fluid confining portion of the device and 0.5 psig (3.45 kPa) for the vapor confining portion of the device, when provided, and an ultimate rupture pressure of not less than five times the design pressure.

5.2 An emergency breakaway fitting shall be constructed to separate in the event that the coupling is subjected to a pull force not less than 100 pounds (445 N), and not to exceed 350 pounds (1557 N).

6 Materials

6.1 Metallic materials

6.1.1 General

6.1.1.1 A metallic part, in contact with the fuels anticipated by these requirements, shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel or if it will impair the function of the device. For all fuel ratings, see Corrosion due to fluid, 6.1.2.1. For products rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 25 percent, see Metallic materials – system level, 6.1.3.

6.1.1.2 The exposed surfaces of metallic parts shall be resistant to atmospheric corrosion if this corrosion will lead to leakage of the fluid or if it will impair the function of the device. The material shall comply with the requirements in Atmospheric corrosion, 6.1.2.2.

6.1.1.3 Metallic parts in contact with the fuels anticipated by these requirements shall not be constructed of lead, or materials that are substantially lead. In addition, no coatings or platings containing lead shall be used, such as terne-plated steel.

6.1.2 Metallic materials – material level

6.1.2.1 Corrosion due to fluid

6.1.2.1.1 All metallic materials used for fluid confining parts shall be resistant to corrosion caused by the fuels anticipated by these requirements. In addition, metallic materials, used internally in fluid confining parts, that are required to operate in some manner to address safety (e.g. plunger on a valve) shall be resistant to corrosion caused by these fuels. This requirement also applies to all tubing, piping, or other interconnection means between components. Compliance is verified by the Long Term Exposure Test, Section 12.

6.1.2.1.2 A coating or plating, applied to a base metal, shall be resistant to the action of the fuels anticipated by these requirements as determined by the Long Term Exposure Test, Section 12.

6.1.2.2 Atmospheric corrosion

6.1.2.2.1 Metallic materials used for fluid confining parts shall be resistant to atmospheric corrosion. In addition, metallic materials that are required to operate to address safety shall be resistant to atmospheric corrosion. Ferrous materials of a thickness specified in the following items are acceptable for the preceding when uncoated:

- a) A casting having a wall thickness of not less than 1/4 inch (6.4 mm) if shown by production test to be free of leakage; and
- b) Fabricated sheet steel parts having a minimum wall thickness of 0.093 inch (2.36 mm).

6.1.2.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 6.1.2.2.3.

6.1.2.2.3 Cadmium plating shall not be less than 0.0003 inch (0.008 mm) thick, and zinc plating shall not be less than 0.0005 inch (0.013 mm) thick, except on parts where threads constitute the major portion of the area in which case the cadmium or zinc plating shall not be less than 0.00015 inch (0.0038 mm) thick. Metallic parts are considered to comply with 6.1.2.2.1 when they are protected against atmospheric corrosion by:

- a) Hot dipped, mill galvanized sheet steel complying with the coating designation G90 in Table I of the Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvannealed) by the Hot Dip Process, ASTM A653/A653M, or
- b) Coatings which have been determined to be equivalent to G90 under the requirements of the Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment, UL 1332.

6.1.2.2.4 A metallic material other than as described in 6.1.2.2.1 – 6.1.2.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

6.1.3 Metallic materials – system level

6.1.3.1 Combinations of metallic materials in products rated for use with gasoline/ethanol blends with nominal ethanol concentrations greater than 25 percent shall be chosen to reduce degradation due to galvanic corrosion in accordance with 6.1.3.2 – 6.1.3.4.

6.1.3.2 Table 6.1 shows the galvanic series for metallic materials exposed to a conductive solution of sea water. The most active material in a given combination will experience increased levels of corrosion, while the most passive material in the combination will experience reduced levels of corrosion. The greater the separation of the materials in the galvanic series of Table 6.1, the more pronounced the effects would be. Table 6.1 serves as a guide in selecting the appropriate test conditions based on manufacturer specified material combinations.

Table 6.1
Galvanic series of metal materials

Most passive	Platinum Gold Graphite Silver Stainless Steel Type 316 (Passive) Stainless Steel Type 304 (Passive) Titanium 13% Chromium Stainless Steel (Passive) 76 Ni – 16 Cr – 7 Fe Alloy (Passive) Nickel (Passive) Silver Solder M-Bronze G-Bronze 70:30 Cupro Nickel Silicon Bronze Copper Red Brass Aluminum Brass Admiralty Brass Yellow Brass 60 Ni – 30 Mo – 6 Fe – 1 Mn 76 Ni – 16 Cr – 7 Fe Alloy (Active) Nickel (Active) Manganese Bronze Tin Stainless Steel Type 316 (Active) Stainless Steel Type 304 (Active) 13% Chromium Stainless Steel (Active) Cast Iron Wrought Iron Mild Steel Aluminum 2024 Cadmium Alclad Aluminum 6053 Aluminum 1100
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Table 6.1 Continued

Most active	Galvanized Steel Zinc Magnesium Alloys Magnesium
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6.1.3.3 Plating, such as nickel plating, can be used to reduce or eliminate dissimilar metal contact areas, as long as the plating material complies with 6.1.3.2 as the contact metal. If used, the plating shall comply with the Long Term Exposure Test, Section 12.

6.1.3.4 Gaskets or nonmetallic spacers used to reduce or eliminate dissimilar metal contact areas, where permitted, shall be subjected to the applicable requirements for static seals in Nonmetallic materials, 6.2, when they are in contact with the fluid.

6.2 Nonmetallic materials

6.2.1 General

6.2.1.1 A nonmetallic part in contact with the fuels anticipated by these requirements, shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel, or if it will impair the function of the device.

6.2.1.2 Gaskets or seals shall be designated as dynamic and/or static seals. See 3.9 and 3.10 respectively. If the type of seal cannot be determined, then the material shall be treated as both a static and a dynamic seal.

6.2.1.3 Gaskets and seals shall comply with the requirements as outlined in Nonmetallic materials – material level, 6.2.2, and Nonmetallic materials – system level, 6.2.3.

6.2.1.4 Nonmetallic materials in contact with the fuels anticipated by these requirements shall not be constructed of the following:

- a) Polysulfide rubber;
- b) Ethylene propylene diene monomer (EPDM) rubber;
- c) Methyl-Methacrylate;
- d) Polyvinyl Chloride (PVC);
- e) Nylon 6/6; or
- f) Polyurethane.